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Southern Pine Beetle

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The southern pine beetle (*Dendroctonus frontalis* Zimm.) is one of the most destructive insect enemies of pine in the South. During major outbreaks, which occur periodically, it kills large quantities of timber throughout the South from Maryland to Texas (fig. 1). Since 1948 outbreaks have occurred

in Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, and Louisiana, and killed three hundred million board feet of pine. It is likely that another one hundred million board feet was killed in unreported outbreaks. In many instances infestations of pine engraver beetles (*Ips* spp.) and the black turpentine beetle (*Dendroc-*

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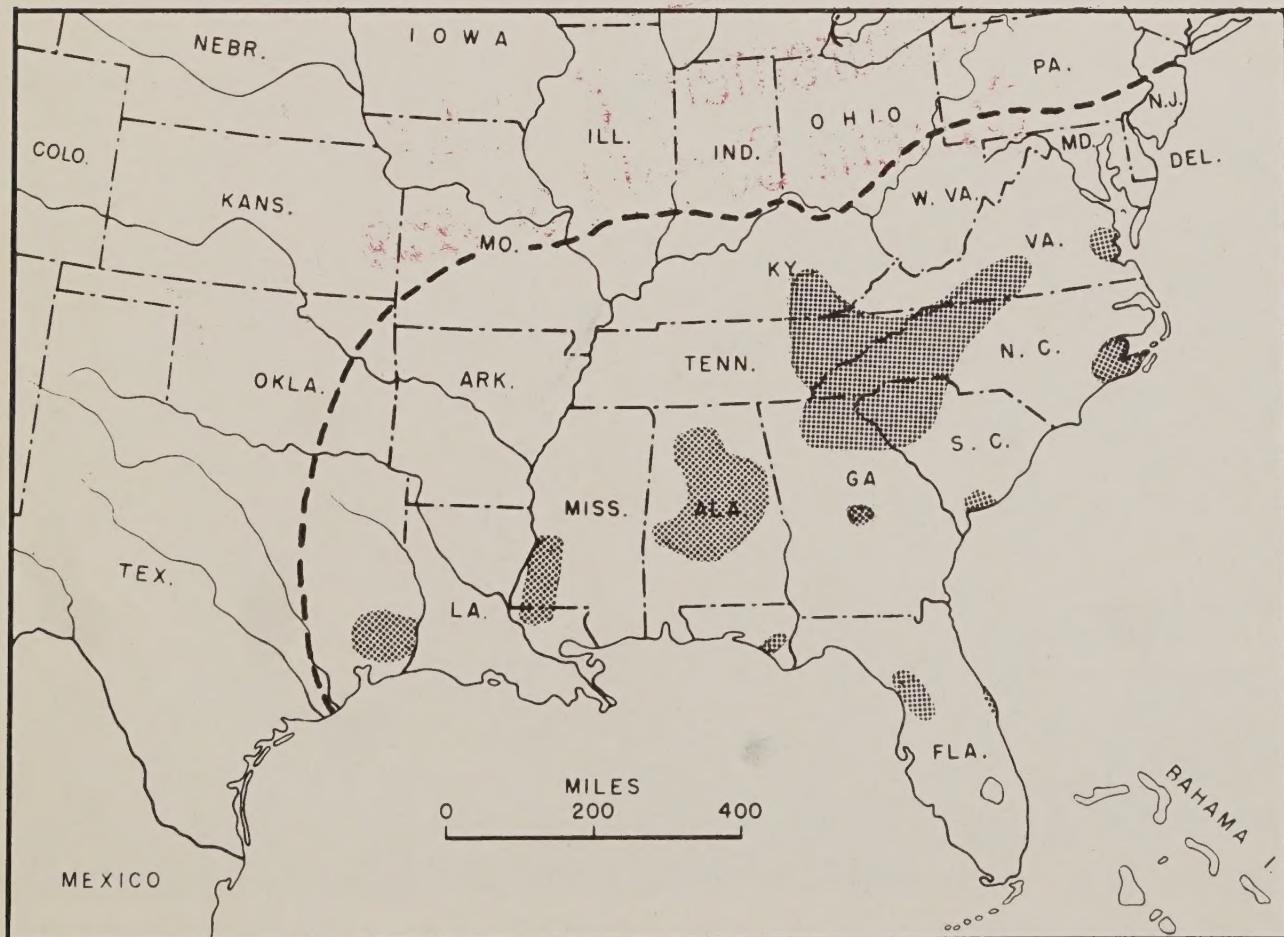


Figure 1.—Distribution of the southern pine beetle in the United States. Shaded parts indicate known outbreak areas occurring since 1948. Dashed line denotes the range of the beetle.

tonus terebrans Oliv.) were associated with these outbreaks.

During periods between outbreaks, there is usually some beetle activity at higher elevations, and small clumps of trees are killed here and there in the forest. At lower elevations, however, along the Coastal Plain and in the Gulf States, the beetle virtually disappears during these periods.

The underlying causes of southern pine beetle outbreaks are unknown. It appears likely that they are caused by conditions that favor an increase in the vigor and size of beetle populations and are unfavor-

able for host trees. Drought, overstocked stands, absence of natural enemies, stand disturbances, and similar conditions may be involved.

Hosts

The beetle attacks all yellow pines; and also white pine, spruce pine, red pine, and red spruce. Attack is frequently unsuccessful on white pine, usually because of heavy exudation of pitch. When beetles attack red spruce they excavate short tunnels and soon die. Shortleaf, loblolly, Virginia, and pitch pines appear to be preferred to slash and longleaf.



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Figure 2.—A kill or "hot spot" of timber infested by the southern pine beetle. The narrow band of light-colored trees in the center of the picture consists of beetle-attacked pines.

Evidence of Attack

The presence of a southern pine beetle outbreak is usually indicated by discoloration of the crowns of infested trees. Discoloration begins with the yellowing of needles in the upper crown, and progresses rather rapidly over the whole crown, with the fading needles soon turning to a reddish brown. Usually large groups of trees are affected; seldom as few as one or two (fig. 2). Examination of the trunks of the discolored trees reveals small yellowish-white masses of pitch called "pitch tubes," one-fourth to one-half inch in diameter. These pitch tubes mark the points of beetle attack. In unusually dry weather, however, there may be no pitch, or only mere traces of it, under bark scales where the beetle bored into the tree. When this occurs, the only evidence of attack may be reddish-brown boring dust lodged in bark crevices and in cobwebs on the trunks, or at the base of the tree.

Removal of a piece of the bark from an infested pine will reveal an array of winding galleries on the inner bark and on the wood surface, a characteristic which clearly distinguishes the presence of the southern pine beetle from any other pine bark beetle in the South (fig. 3). If the attack is recent, there may be some adults in the egg galleries or very tiny, whitish larvae near the galleries. In older attacks, most of the brood will be within the bark.



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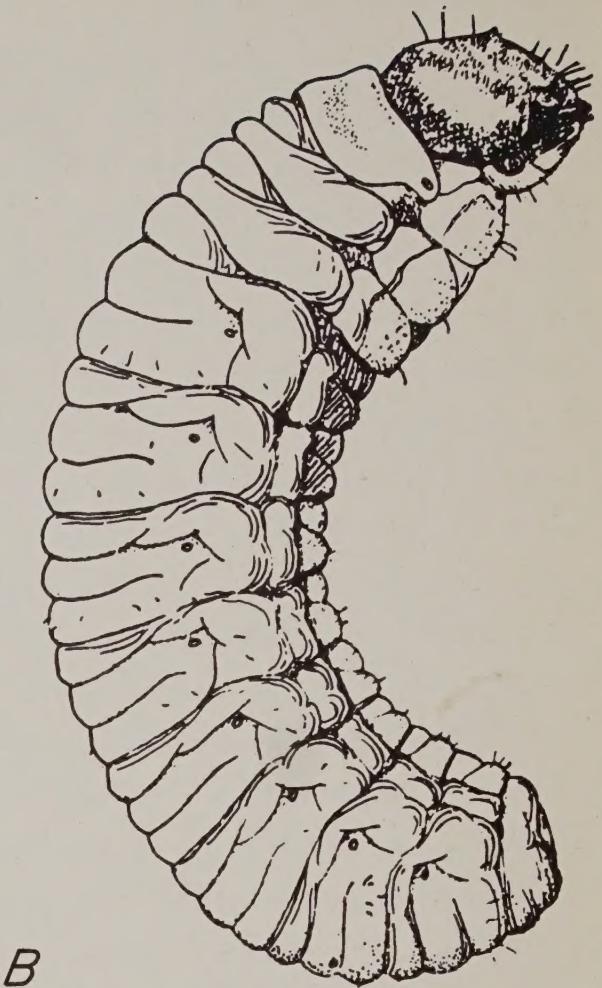
Figure 3.—Array of winding egg galleries made by beetles in the bark of pine.

Description

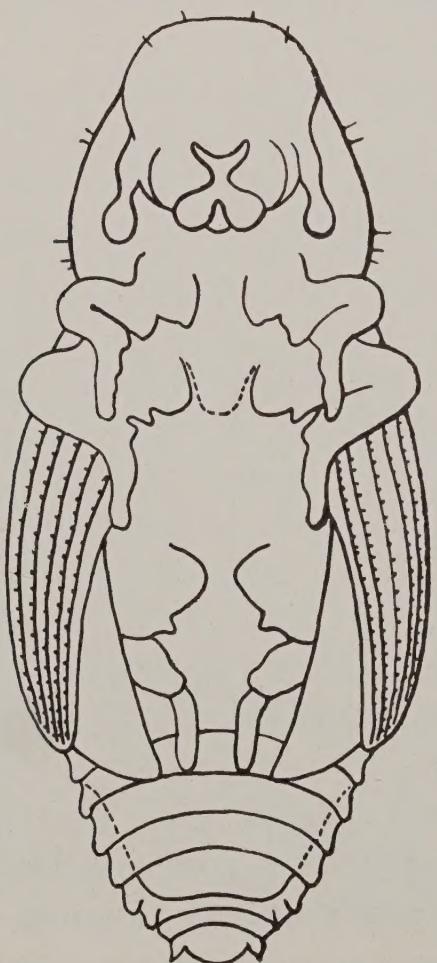
In its development the southern pine beetle passes through the egg, larval, pupal, and adult stages. The egg (fig. 4, *A*) is pearly white and barely visible to the naked eye. It hatches into a tiny, whitish, legless larva with a glossy, reddish-brown head; the body is wrinkled and curved (fig. 4, *B*). The larva transforms into the resting stage or pupa (fig. 4, *C*) which is pure white and very fragile, then into the adult stage. The young adult beetle is soft and whitish in color, but soon hardens and darkens. Older beetles are a dull, dark brown, and their wings are a lighter shade than the



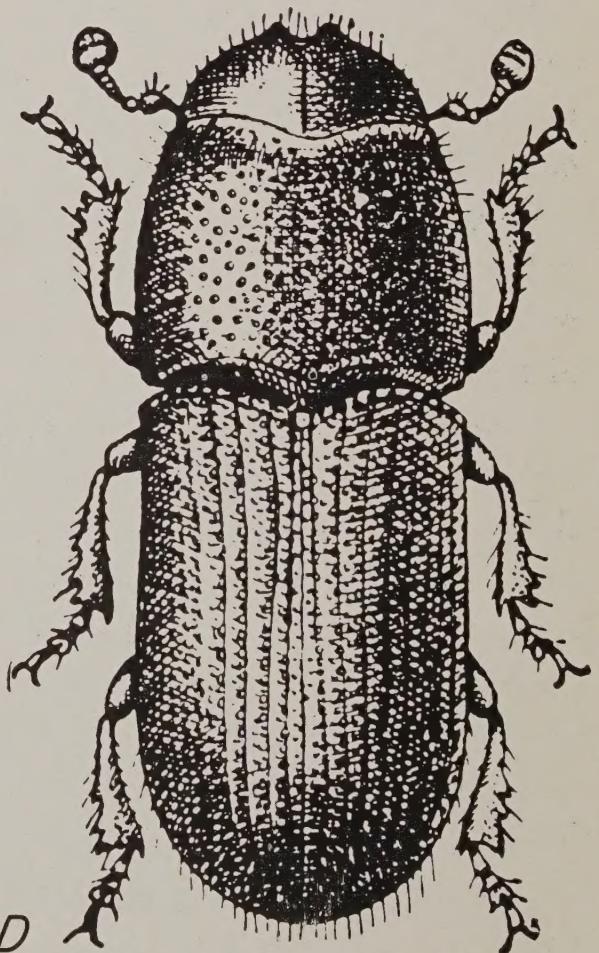
A



B



C



D

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Figure 4.—Stages of the southern pine beetle: *A*, egg; *B*, larva; *C*, pupa; *D*, adult.

foreparts of their bodies. The beetle is short legged, stout, and about one-eighth inch long. The forepart of its head is notched, and the hind end of its body is rounded (fig. 4, *D*).

Life History

The insect overwinters in the bark in the egg, larval, pupal, and adult stages. Beetles of overwintering broods begin to emerge and attack trees in the spring (April-May) about the time that dogwood is in full bloom. The life cycle from egg to adult requires 30 to 40 days and four to six generations are produced a year, with considerable overlapping. Beetle populations and beetle activity generally reach a peak in late summer and early fall. Activity usually ceases by November; however, beetle flights and attacks do occur in winter during prolonged warm spells, even at higher elevations in the mountains. The number of beetles may increase as much as ten-fold in a single season.

Habits

Southern pine beetles usually attack the midtrunk of a tree first, then "fill in" both upward and downward. While larger trees are more commonly attacked, trees as small as 2 inches in diameter also may be infested. When beetles attack they bore through the bark to the wood where they then excavate long winding galleries in the inner bark. Eggs are laid in niches about one-half inch apart along the sides of the gallery. Newly hatched larvae mine in the phloem or soft

inner bark for about one-half inch. Older larvae mine outward into the corky bark. In about 4 weeks the larvae stop feeding and excavate cells near the bark surface in which they pupate. Pupation is completed in about 1 week at which time the adult beetle bores to the bark surface and emerges. Bark from which beetles have emerged appears as if hit by birdshot (fig. 5).

Applied Control

The primary object in the application of control measures is to reduce the beetle population to the lowest possible level as rapidly as possible. Salvage is the cheapest and often the most practical form of control. It must be emphasized that in salvage operations *trees containing beetle brood should be removed first and promptly*. At the mill the material should be processed immediately and the bark and bark slabs burned.

When salvage is not possible, the application of a toxic insecticide is very effective in killing the beetle brood in infested trees. Benzene hexachloride (BHC) $\frac{1}{4}$ percent gamma isomer in No. 2 fuel oil is the most satisfactory formulation. (In the mountains a $\frac{1}{2}$ -percent concentration should be applied in the wintertime to provide longer lasting residual action.) The spray solution can be prepared from oil concentrates available on the market. Since most of these concentrates contain 1 pound of the gamma isomer of BHC per gallon, the $\frac{1}{4}$ -percent spray solution is prepared by adding 1 part of



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Figure 5.—Emergence holes of adults of the southern pine beetle in the bark of pine.

the concentrate to 56 parts of oil (by volume). In employing this control method, trees are felled, and a coarse spray of the insecticide is applied until the bark is wet and dripping. It should never be applied to wet bark. **CAUTION:** Care should be taken to avoid prolonged contact of benzene hexachloride with the skin. This chemical may be absorbed by the skin and produce harmful effects.

In small, localized outbreaks where it is not feasible to salvage or spray, infested trees should be felled, limbed, and the brood killed by exposing the infested trunks to the heat of the sun; the logs should be rolled over every 2 or 3 days to insure killing the insects on all sides. Peeling and burning the bark also gives good control.

One of the most important measures for successful control of the

beetle is a check of treated areas. During initial control operations, newly infested trees are very likely to be overlooked and left untreated. If so, they may be a source of continuing infestation. Therefore, areas treated from April through October should be checked every 3 weeks for 9 weeks after treatment and all untreated infested trees found should be removed or sprayed. Bimonthly examinations are sufficient for areas treated during the winter.

Natural Control

Natural enemies, including insect parasites, predators, diseases, and

woodpeckers, rarely have a notable effect on the southern pine beetle during severe outbreaks, although they undoubtedly do exert some degree of control. The full effect of these biological control factors and the conditions under which they are most effective have never been determined.

Perhaps the most effective of all natural control factors is low winter temperatures. When temperatures approach 0° F. and persist for several days, high beetle mortality results. This form of control occurs most commonly at high elevations and in the northern part of the insect's range.

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